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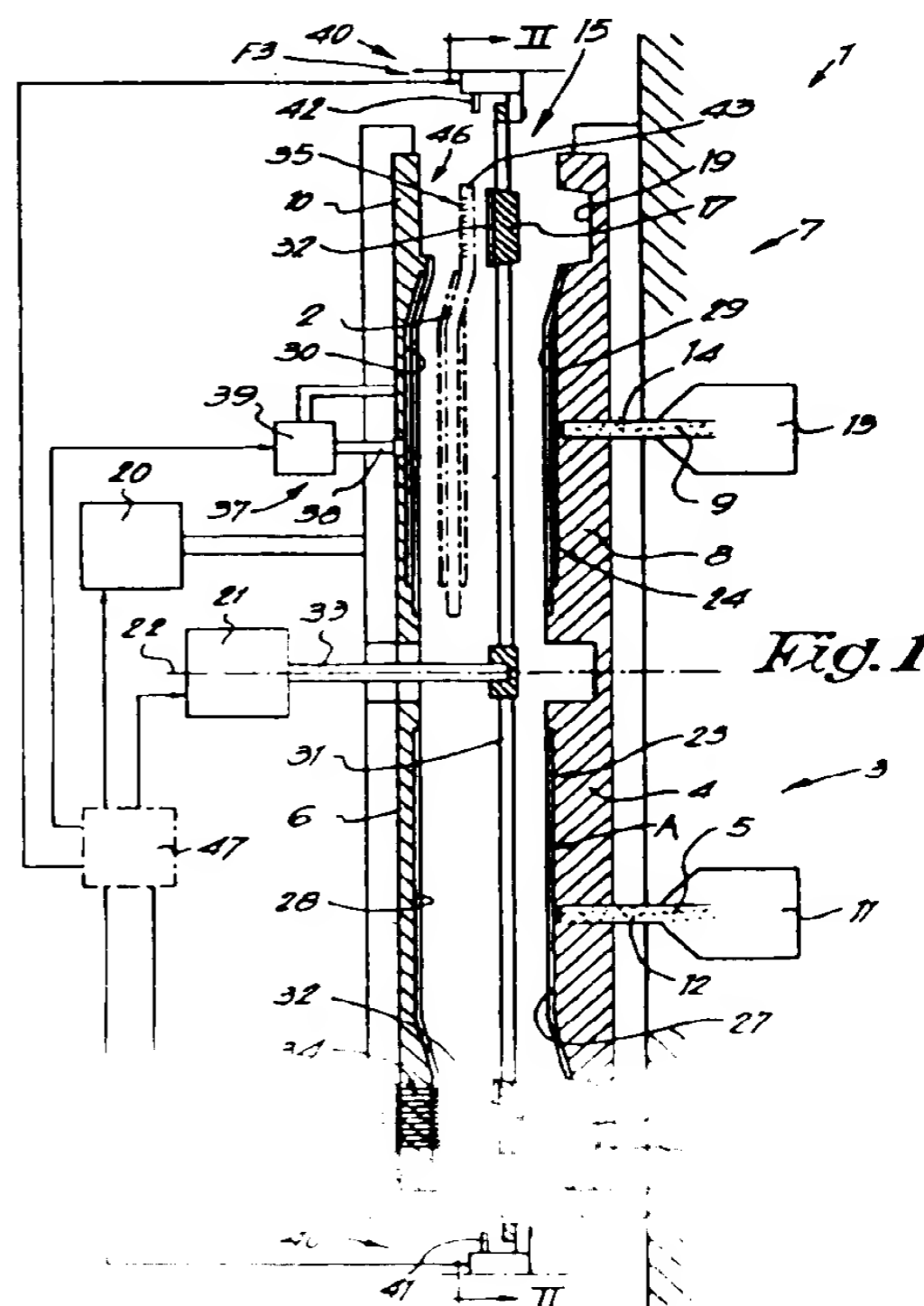
(71) Applicant:  
Boucherie, Bart Gerard  
8870 Izegem (BE)

(72) Inventor: Boucherie, Bart Gerard  
8870 Izegem (BE)

(74) Representative: Donné, Eddy  
Bureau M.F.J. Bockstael nv  
Arenbergstraat 13  
2000 Antwerpen (BE)

### (54) Method and device for manufacturing brush bodies for tooth brushes

(57) Method for manufacturing brush bodies for tooth brushes, in particular for injection moulding brush bodies (2) consisting of at least two components (5-9), of the type whereby at least one first injection moulding piece (25) is formed of a first component (5) in a first mould (3), consisting of at least two mould parts (4-6); whereby at least one second injection moulding piece (26) is formed by providing the first injection moulding piece (25) in a second mould (7), which also consists of at least two mould parts (8-10), and by providing a second component (9) on the first injection moulding piece (25) in said second mould (7); and whereby every injection moulding piece (25) formed in the first mould (3) is transferred to the second mould (7) by means of a transfer part (15) provided between the mould parts (4-6-8-10) of the above-mentioned moulds (3-7), characterized in that the injection moulding pieces (25) formed in the first mould (3) are secured to the transfer part (15) during the transfer to the second mould (7) for at least part of this movement by means of securing means (40) which can be activated.



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## Description

The present invention concerns a method and device for manufacturing brush bodies for tooth brushes.

In particular, it concerns a method for injection moulding brush bodies consisting of at least two components, of the type whereby at least one first injection moulding piece is formed of a first component in a first mould, consisting of at least two mould parts; whereby at least one second injection moulding piece is formed by providing the first injection moulding piece in a second mould, which also consists of at least two mould parts, and by providing a second component on the first injection moulding piece in said second mould; and whereby every injection moulding piece formed in the first mould is transferred to the second mould by means of a transfer part provided between the mould parts of the above-mentioned moulds.

Methods of the above-mentioned type, as well as devices to realize such methods, are known from EP 0.504.571 and DE.4.127.621.

The invention aims to further perfect these known methods, such that the injection moulding can be carried out considerably smoother than has been the case until now.

To this aim, the present invention in the first place concerns a method of the above-mentioned type, characterized in that the injection moulding pieces formed in the first mould are secured against the transfer part during the transfer to the second mould for at least part of this movement by means of securing means which can be activated, preferably clamping means. The use of securing means which can be activated offers the advantage that such a clamping of the injection moulding pieces to the transfer part is obtained that malfunctions due to the undesired coming loose of the injection moulding pieces from the transfer part is excluded on the one hand, and that injection moulding pieces only have to be clamped over a very short length on the other hand.

According to a particular characteristic of the invention, no pins for the formation of holes to insert the brush hair in are provided in the transfer part, and such pins are exclusively provided in the first mould. Consequently, a single series of pins will be sufficient, as a result of which the device will be considerably cheaper and easier to maintain. For, being precision parts, such pins are costly. Moreover, they are very vulnerable.

According to another particular characteristic of the invention, whereby use is preferably made of moulds which are composed of a fixed and a moveable mould

part, the moveable mould part is moved in relation to the fixed mould part on the one hand, and by moving the transfer part in relation to the fixed mould part on the other hand, both in the same direction.

As the above-mentioned movements are carried out in the same direction, this offers the advantage that the ejection can be carried out smoother and faster than in the case where, as described in EP 0.504.571 and DE 4.127.621, the moveable mould parts first have to be moved in one direction together with the transfer part, after which the transfer part is moved back in the opposite sense into an intermediate position.

The present invention also concerns a device applying the above-mentioned method.

In order to better explain the characteristics of the invention, the following preferred embodiments are described as an example only without being limitative in any way, with reference to the accompanying drawings, in which:

figure 1 schematically represents a section of a device according to the invention in open position; figure 2 represents a section according to line II-II in figure 1;

figure 3 shows a section of a possible embodiment of the part which is indicated with arrow F3 in figure 1;

figures 4 to 10 show the device of figure 1 in different positions;

figure 11 schematically represents a variant of the part which is indicated with arrow F11 in figure 6;

figures 12 and 13 schematically represent two variants of figure 2;

figure 14 schematically represents a variant of the part which is indicated with F14 in figure 2;

figures 15 and 16 represent schematic sections according to line XV-XV in figure 14 for two positions;

figure 17 shows another variant of the part which is indicated in figures 15 and 16.

As represented in the figures, the invention is related to a device 1 for injection moulding brush bodies 2 for tooth brushes.

The device 1 mainly consists of the combination of a first mould 3 which in this case is formed of a fixed mould part 4 through which the first component 5 is injected and a moveable mould part 6; a second mould 7 which in this case is formed of a fixed mould part 8 through which the second component 9 is injected and a moveable mould part 10; a first injection device 11 which is connected to a supply duct 12 in the fixed mould part 4; a second injection device 13 which is connected to a supply duct 14 in the fixed mould part 8; a transfer part 15 provided between the fixed mould parts 4-8 and the moveable mould parts 6-10, which in the

driving means 20 to open the moulds 3-7 in this case to move the moveable mould parts 6-10 in relation to the fixed mould parts 4-8; and driving means 21 to move the transfer part 15 laterally on the one hand and to move

the transfer part 15 between the moulds 3 and 7 on the other hand, in this case by rotating it around a shaft 22.

The two moulds 3 and 7 preferably form a whole. The mould parts 4 and 8 are formed of a single plate, whereas the mould parts 6 and 10 are formed a second plate.

The moulds 3 and 7 are preferably each provided with several mould impressions 23-24 which make it possible to simultaneously form several injection moulding pieces 25 in the first mould 3 as well as several injection moulding pieces 26 in the second mould 7. To this aim, the mould parts 4-6-8-10 have several cavities 27-28-29-30 provided parallel to one another.

In the example shown, the transfer part 15 mainly consists of a rotatable frame 31 onto which the insertion parts 16-17 are fixed. These insertion parts 16-17 consist for example of laths which are provided with recesses 32 which are part of the mould impressions 23-24 when the whole is in closed position.

The frame 31 is fixed to a shaft 33 which is coupled to the driving means 21.

The driving means 20 to move the mould parts 6-10 can be of any nature whatsoever. Preferably, use will be made of a drive system with a hydraulic cylinder which is connected to the mould parts 6-10 either directly or by means of a buckling arm.

In this case, the driving means 21 are designed such that they can provide both for a lateral movement of the transfer part 15 as for a rotation thereof. As represented, they are preferably situated on the side of the moveable mould parts 6-10.

In the example of figures 1 to 10, the device 1 according to the invention is also provided with a series of pins 34 which reach into the mould impression 23 when the whole is in closed position and which are designed to form holes 35 at a later stage to insert brush hair in the brush bodies 2. These pins 34 are preferably only present in the moveable mould part 6 of the first mould 3.

These pins 34 can be moved between a position in which they protrude in the mould impression 23 and a position in which they are withdrawn in the mould part 6. In the example shown, this movement is obtained by means of driving means 36 which are fixed to the mould part 6. However, it is clear that this movement can also be realised in other ways, for example by means of a stop system which is carried out such that the movement of the moveable mould parts 6-10 at the right moment also results in a movement of the pins 34 in relation to the mould part 6.

The mould 3 is provided with means which make sure that, when this mould 3 is opened, every injection

cavities 27 are formed such that the injection moulding pieces 25 formed herein are so to say slightly encapsulated, so that they can only be removed from the cavities 27 with a certain effort. Preferably, such a counter draft will only be carried out locally, for example on the spot indicated with arrow A in figure 1. This spot can possibly be selected such that traces remaining on the injection moulding pieces 25 due to the presence of the counter draft are hidden from view as they are sprayed over later on by the second component 9.

As represented in the figures, the second mould 7 is preferably provided with ejection means 37 to extract the injection moulding pieces 26, which normally form the ready-for-use brush body 2, from the mould 7. These ejection means 37 are preferably provided on the moveable mould part 10 and may consist, as is schematically represented, of moveable press-out elements 38 which are controlled by means of appropriate driving means 39.

It should be noted that the second mould 7 is made such that, when the moveable mould part 10 is removed in relation to the fixed mould part 8, with the transfer part 15 remaining in the fixed mould part 8, the injection moulding piece 26 formed in the second mould 7 will adhere to the moveable mould part 10 and thus will come loose from the fixed mould part 8. This can be realized thanks to an appropriate design of the cavities 29 and 30.

The device 1 is provided with securing means 40 according to the invention which, when activated, prevent the injection moulding pieces 25 concerned from coming loose from the transfer part 15. As represented in the figures 2 and 3, these securing means 40 are fixed to the transfer part 15 and consist of moveable supports 41-42 which can move in front of the heads 43 of the injection moulding pieces 25. The movement of the supports 41-42 is obtained for example by means of carriages 44 and pressure cylinders 45, as represented in figure 3, or in any other way whatsoever.

In the second mould 7 is provided a recess 46 which makes it possible for the mould 7 to be closed, even when a support 41 or 42 is provided between the mould parts 8-10.

According to the invention, the device 1 is preferably also provided with control means 47 and/or driving means 20 and 21 which are made such that, as will become clear further from the description of the different positions, the injection moulding pieces 25 formed in the first mould 3 will be ejected on either side thanks to a movement in the same direction of the mould part 6 in relation to the mould part 4 on the one hand, and of the transfer part 15 in relation to the fixed mould part 4 on the other hand.

The securing means 40 can also be controlled by means of the control means 47.

According to another characteristic of the invention, as represented in the figures, use is made of insertion

the mould 3 is preferably provided with a counter draft, for example at the height of the part of the mould impression 23 where the handle of the brush body 2 is formed. Such a counter draft implies that the

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15

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25

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35

40

50

4

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25

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35

40

50

injection moulding piece 25 against the fixed mould part 4 during a part of the movement of the mould part 6, sufficiently far to make it possible for the securing means 40, and in particular the supports 41 or 42 to be presented to the injection moulding pieces 25 before said ejector comes loose from the ejection moulding pieces concerned.

Although the ejection preferably takes place by means of a movement in the same direction of the mould parts 6-10 in relation to the mould parts 4-8, and of the transfer part 15 in relation to the mould parts 4-8, it is not excluded to select another sequence for the movement of the various parts. According to an alternative, the transfer part 15, and consequently also the injection moulding pieces 25, can be moved along during the opening of the mould 3, whereas the pins 34 are not withdrawn yet. Subsequently, the transfer part 15 can be moved back in the direction of the fixed mould part 4, together with the pins 34 which are further extended, whereby the injection moulding pieces 25 move along, as they are clamped between the latter two. Next, the securing means 40 can be activated. In this case, these securing means are made such, however, that the injection moulding pieces 25 are clamped or secured on those places where there are no pins 34. By then withdrawing the pins 34 into for example the position in which they are normally situated during the injection moulding, the injection moulding pieces 25 are suspended freely on the transfer part 15, after which the method can be continued stepwise as described above.

Figure 11 schematically represents a variant whereby use is made for the lateral drive of a common driving element 50. The movement of the transfer part 15 between the moulds 3-7, in this case the rotation thereof, is carried out by means of a separate driving element 51. The transfer part 15 is hereby supported on the mould parts 6-10 by means of a spring 52.

Figure 12 schematically shows how the mould impressions 23-24 can also be directed with the parts 48 towards the inside, in other words with the parts forming the handles directed away from the axial line 49.

Figure 13 schematically shows a multiple embodiment, whereby every mould 3-7 is provided with six mould impressions, 23-24 respectively.

Figures 14 to 16 schematically show a variant of the securing means 40. To this end, a rotatable and slidable clamping element 53 which is countersunk in a recess 54 in rest position is provided at every end of the transfer part 15, as is represented in the figures 14 and 15, and it is placed in front of the heads 43 in the clamping position and is possibly also tightened against them

of the clamping element 53 is carried out by means of a driving element 59.

It should be noted that the driving elements 58 and 59 do not necessarily have to be mounted on the transfer part 15. It is clear that they can be erected on the perimeter of the transfer part 15 or behind the fixed mould part 4, whereby couplings are provided which automatically provide for a connection with for example a tooth lath 55 and the shaft 57 in the positions in which the transfer part 15 is standing still.

Finally, figure 17 shows another variant of a mechanism to rotate the shaft 57 to and fro which makes use of a fork 60 mounted fixed on the shaft 57 which cooperates with a pin 61 provided on a moveable element 62.

It should be noted that the main idea of the invention can also be used for embodiments in which both mould parts can be moved.

Naturally, the main idea of the invention can also be used for devices having a rotatable transfer part which cooperates with or is part of the moveable mould parts.

It is clear that the device 1 according to the invention can also be carried out with several successive moulds, for the injection moulding of more than two components, whereby the transfer of the injection moulding pieces can also be carried out by means of a similar transfer part 15. The rotation is then carried out over less than 180°, for example 120° in the case of three moulds.

It is also clear that it is possible with a device according to the invention to hold the injection moulding pieces 25 very locally. Although they are preferably held at the head 43, they can also be held in other parts, for example at the neck, in other words the transition between the head 43 and the handle, so that an extra synthetic component can be provided on the head 43 in the second mould 7.

In the case where a second component is added to the heads 43, the device 1 will be preferably provided with a second series of pins which cooperate for example with the second mould 7 and which take place in the holes 35 which are already formed. As a result, the holes 35 stay open, on the one hand because no synthetic material can penetrate in the holes 35 due to the fact that the holes 35 are filled, and on the other hand because these pins offer a support for the heads 43 concerned, so that these heads 43 will not deform due to the injection pressure prevailing in the second mould 7, as a result of which the second component cannot find its way around the head 43 already formed. This second series of pins can be provided on a fixed spot in the mould 7, which implies that they cannot shift in rela-

tion to the transfer part 15. These pins can also be erected in a floating manner, so that they can easily penetrate in the already formed holes 35 at any time, even when the injection moulding pieces 25 are slightly deformed due

to the injection pressure. These pins can also be erected in a floating manner, so that they can easily penetrate in the already formed holes 35 at any time, even when the injection moulding pieces 25 are slightly deformed due

to shrinkage at the time they are provided in the second mould 7. The diameter of these pins must not be identical to that of the pins 34 either. This second series of pins may cover the entire hole pattern, but according to a variant it may also cover only part of it, whereby this part coincides for example with the part of the head 43 which is provided with a second component. Nor must the pins of this second series extend over the entire depth of the holes. In fact, these pins may also be formed of small sealing elements, for example with a conical point, which are pressed against the entries of the holes 35.

It should be noted that the invention also concerns devices 1 whereby, instead of the pins 34, the brush hairs are presented in the mould, for example the mould 3, by means of suitable means, such that the brush hairs are cast in directly.

Although, as described above, the injection moulding pieces 25-26 are directed with their heads 43 outwards in relation to the point of rotation of the transfer part 15, it is not excluded to place the injection moulding pieces 25-26 the other way round, i.e. with their handles towards the outside. This offers the advantage that the parts of the transfer part 15 and of the securing means 40 are situated closer to the centre of rotation, which restricts the inertia effect.

Instead of a transfer part 15 which can only rotate in order to move between the moulds 3 and 7, a transfer part could be used which makes another movement to this end, for example a movement consisting of one or several translations or a combined translation and rotation movement. In the case of a translation, the moulds 3 and 7 will be situated next to one another.

The present invention is by no means restricted to the embodiments described above and represented in the accompanying drawings; on the contrary, such a method and device according to the invention can be made in all sorts of variants while still remaining within the scope of the invention.

#### Claims

1. Method for manufacturing brush bodies for tooth brushes, in particular for injection moulding brush bodies (2) consisting of at least two components (5-9), of the type whereby at least one first injection moulding piece (25) is formed of a first component (5) in a first mould (3), consisting of at least two mould parts (4-6); whereby at least one second injection moulding piece (26) is formed by providing the first injection moulding piece (25) in a second

second mould (7) and whereby every injection moulding piece (25) formed in the first mould (3) is transferred to the second mould (7) by means of a transfer part (15) provided between the mould parts

(4-6-8-10) of the above-mentioned moulds (3-7), characterized in that the injection moulding pieces (25) formed in the first mould (3) are secured to the transfer part (15) during the transfer to the second mould (7) for at least part of this movement by means of securing means (40) which can be activated.

2. Method according to claim 1, characterized in that use is made of moulds (3-7) with a fixed mould part (4-8) and a moveable mould part (6-10), whereby the transfer part (15) cooperates with the fixed mould parts (4-8), and in that the injection moulding pieces (25-26) formed in the moulds (3-7) are ejected on either side by moving the moveable mould parts (6-10) in relation to the fixed mould parts (4-8) on the one hand, and by moving the transfer part (15) in relation to the fixed mould parts (4-8) on the other hand, both in the same direction.
3. Method according to claim 2, characterized in that, during the ejection, the moveable mould parts (6-10) are moved first and subsequently the transfer part (15).
4. Method according to any of the preceding claims, characterized in that the injection moulding pieces (25) formed in the first mould (3) are exclusively held at the heads (43) of the brush bodies (2) to be formed during the transfer of the first mould (3) to the second mould (7).
5. Method according to any of the preceding claims, characterized in that the transfer part (15) undergoes a translation during its movement between the moulds (3-4).
6. Method according to any of claims 1 to 4, characterized in that use is made of a rotatable transfer part (15).
7. Method according to claim 6, characterized in that the transfer part (15) is further rotated stepwise, each time in the same sense of rotation.
8. Device for manufacturing brush bodies for tooth brushes according to the method of claim 1, which mainly consists of the combination of a first mould (3) with at least two mould parts (4-6) which can be moved in relation to one another; a second mould (7) with also two mould parts (8-10) which can be moved in relation to one another; a transfer part (15) which cooperates with the second mould (7), a transfer part (15) which is mounted between the above-mentioned mould parts (4-6-8-10); driving means (20) to open and close the moulds (3-7); and

driving means (21) to move the transfer part (15) laterally on the one hand and to move this transfer part (15) between the moulds (3-7) on the other hand, characterized in that the device (1) is provided with securing means (40) which can be activated and which cooperate with the transfer part (15) so as to hold the injection moulding pieces (25) formed in the first mould (3) against the transfer part (15).

9. Device according to claim 8, characterized in that the moulds (3-7) each consist of a fixed mould part (4-8) and a moveable mould part (6-10), and in that the device (1) has control means (47) to control the above-mentioned driving means (20-21), whereby these control means (47) and/or the above-mentioned driving means (20-21) are made such that the formed injection moulding pieces (25-26) will be ejected on either side thanks to a movement in the same direction of the moveable mould parts (6-10) in relation to the fixed mould parts (4-8) on the one hand, and of the transfer part (15) in relation to the fixed mould parts (4-8) on the other hand.

10. Device according to claim 8 or 9, characterized in that the transfer part (15) is provided with insertion pieces (16-17) which are situated at the height of the parts (48) of the mould impressions (23-24) in which the heads (43) of the injection moulding pieces (25-26) are formed.

11. Device according to any of claims 8 to 10, characterized in that the mould impressions (23-24) are directed towards the outside with the parts (48) in which the heads (43) of the injection moulding pieces (25-26) are formed.

12. Device according to any of claims 8 to 11, characterized in that the securing means (40) consist of supports (41-42) or clamping elements (53) which exclusively cooperate with the above-mentioned heads (43).

13. Device according to any of claims 8 to 12, characterized in that the transfer part (15), in particular the insertion pieces (16-17) provided herein, cooperate with, in particular can be inserted in fixed mould parts (4-8).

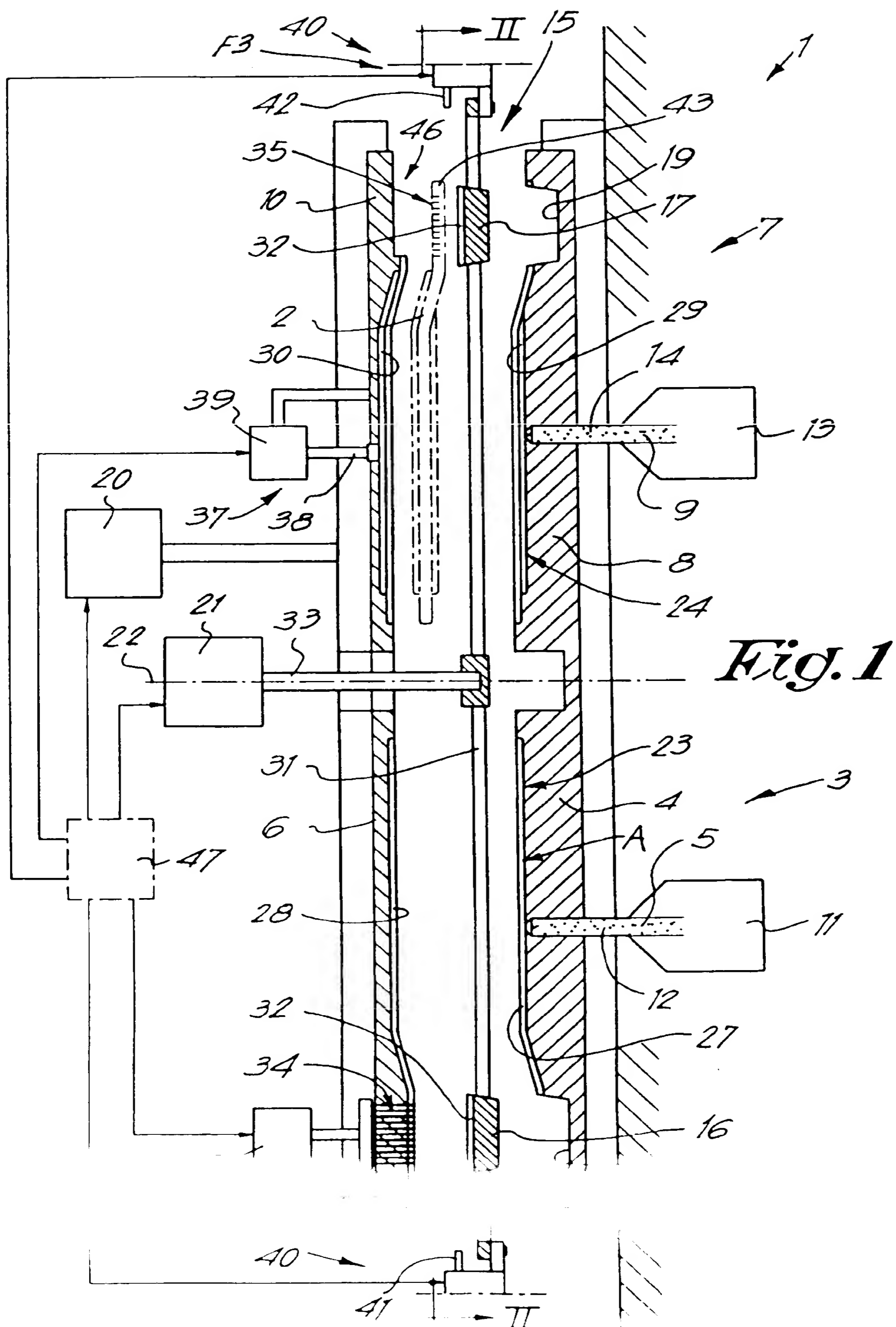
14. Device according to any of the preceding claims, characterized in that it is provided with a common driving element (50) to move the mould parts (6-10)

15. Device according to any of claims 8 to 14, characterized in that the securing means (40) are provided

with one or several driving elements (58-59) to activate the securing means (40) which are erected as separate in relation to the movable transfer part (15), but which are coupled to it when said transfer part (15) is in any of its rest positions.

16. Device according to any of claims 8 to 15, characterized in that it is provided with pins (34) to form the holes (35) in which the brush hairs must be inserted, or with means which present the brush hairs directly with their parts to be inserted in the mould impressions (23) concerned, characterized in that such pins (34) or the above-mentioned means are exclusively situated on the first mould (3), whereby these pins (34) or the above-mentioned means cooperate with either of the mould parts (4-6).

17. Device according to any of claims 8 to 16, characterized in that it has a mould (3) which is provided with pins (34) to form the holes (35) in which the brush hairs must be inserted; in that it has a mould in which a component is applied on the head (43) of the injection moulding piece formed in the first-mentioned mould (3); and in that it is provided with a second series of pins which can be provided in the holes formed by the above-mentioned pins (34), or a number of such holes, during the application of the above-mentioned component, so that the formed holes stay open and/or so that a support against deformation is offered.



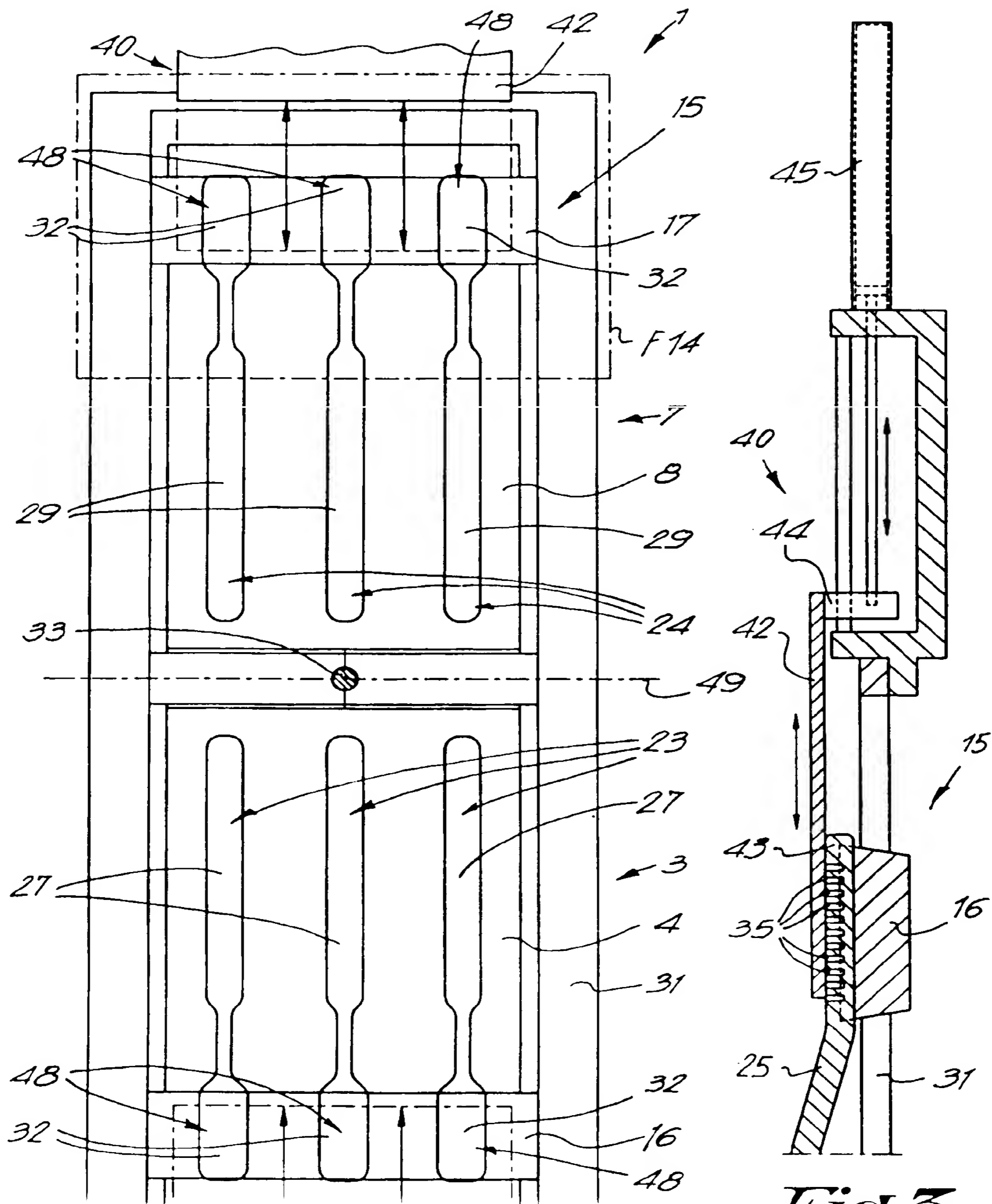
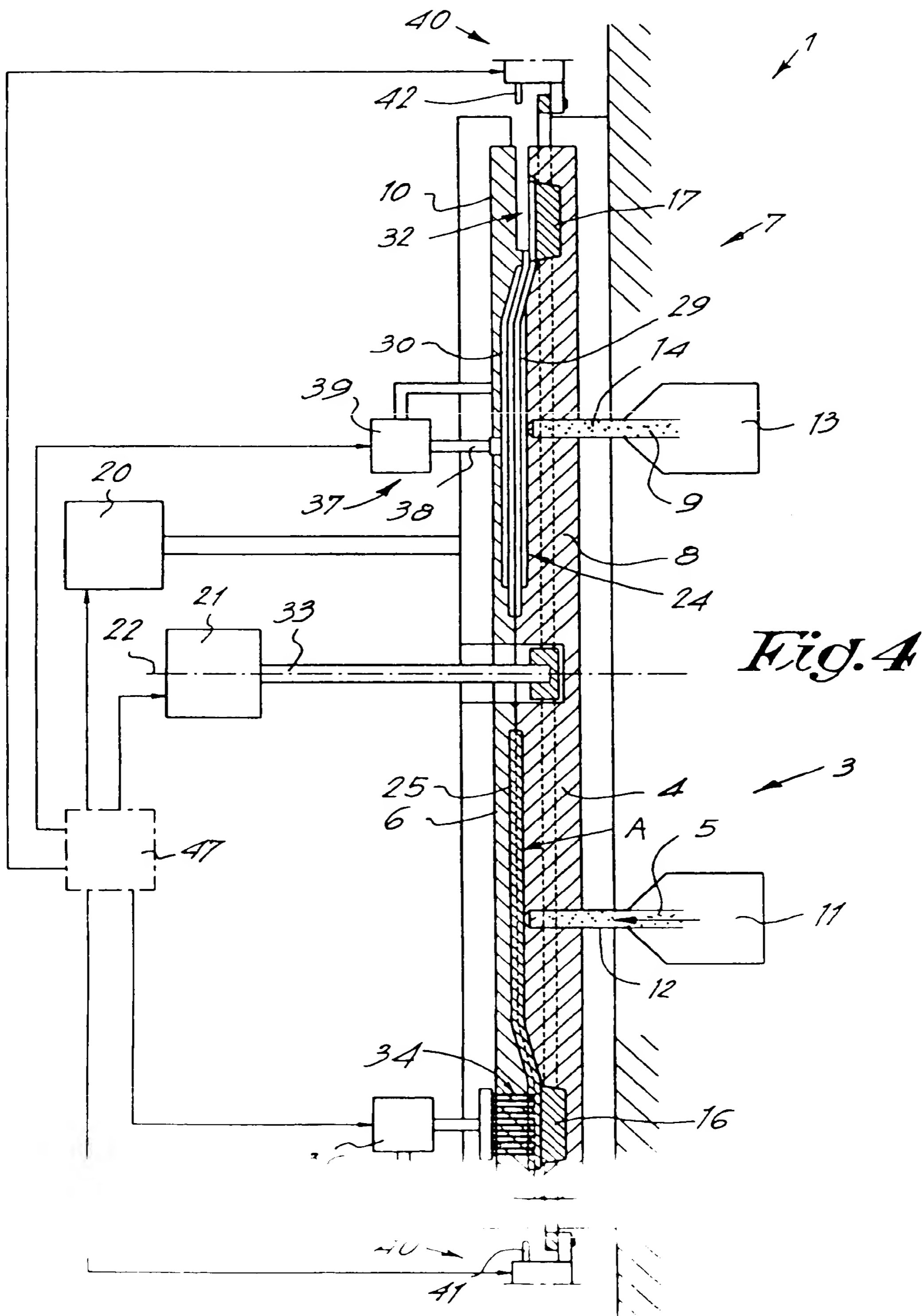
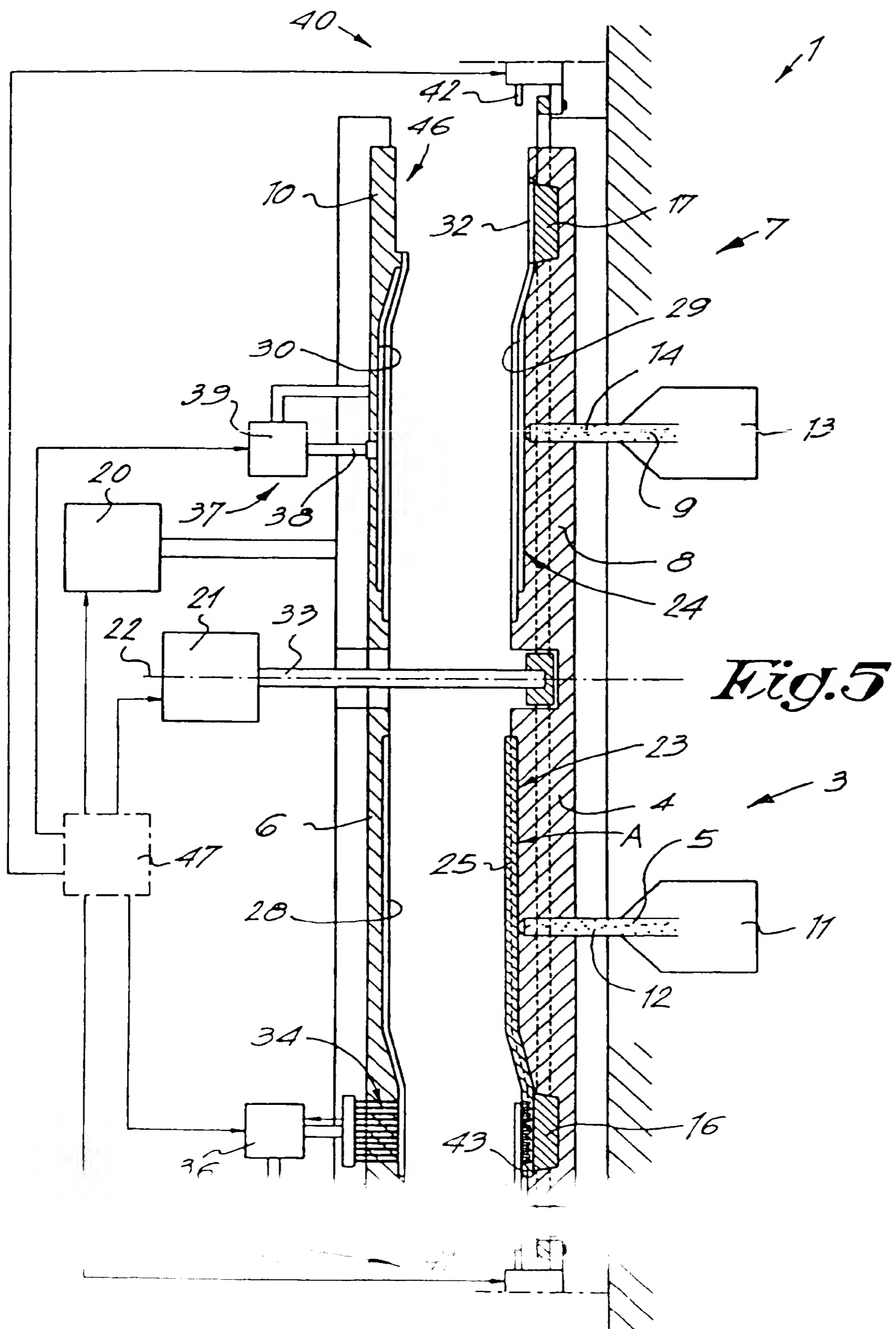
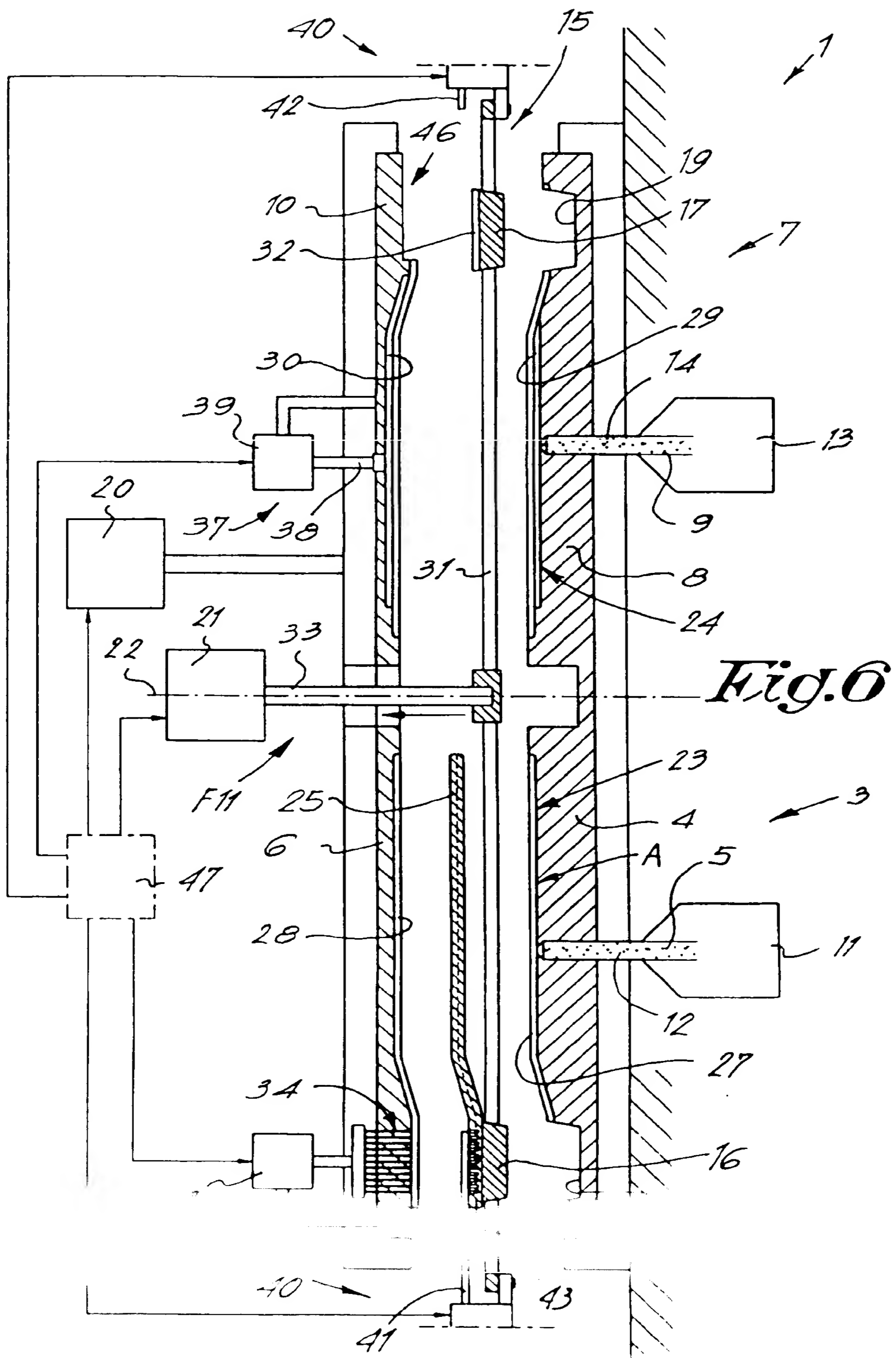


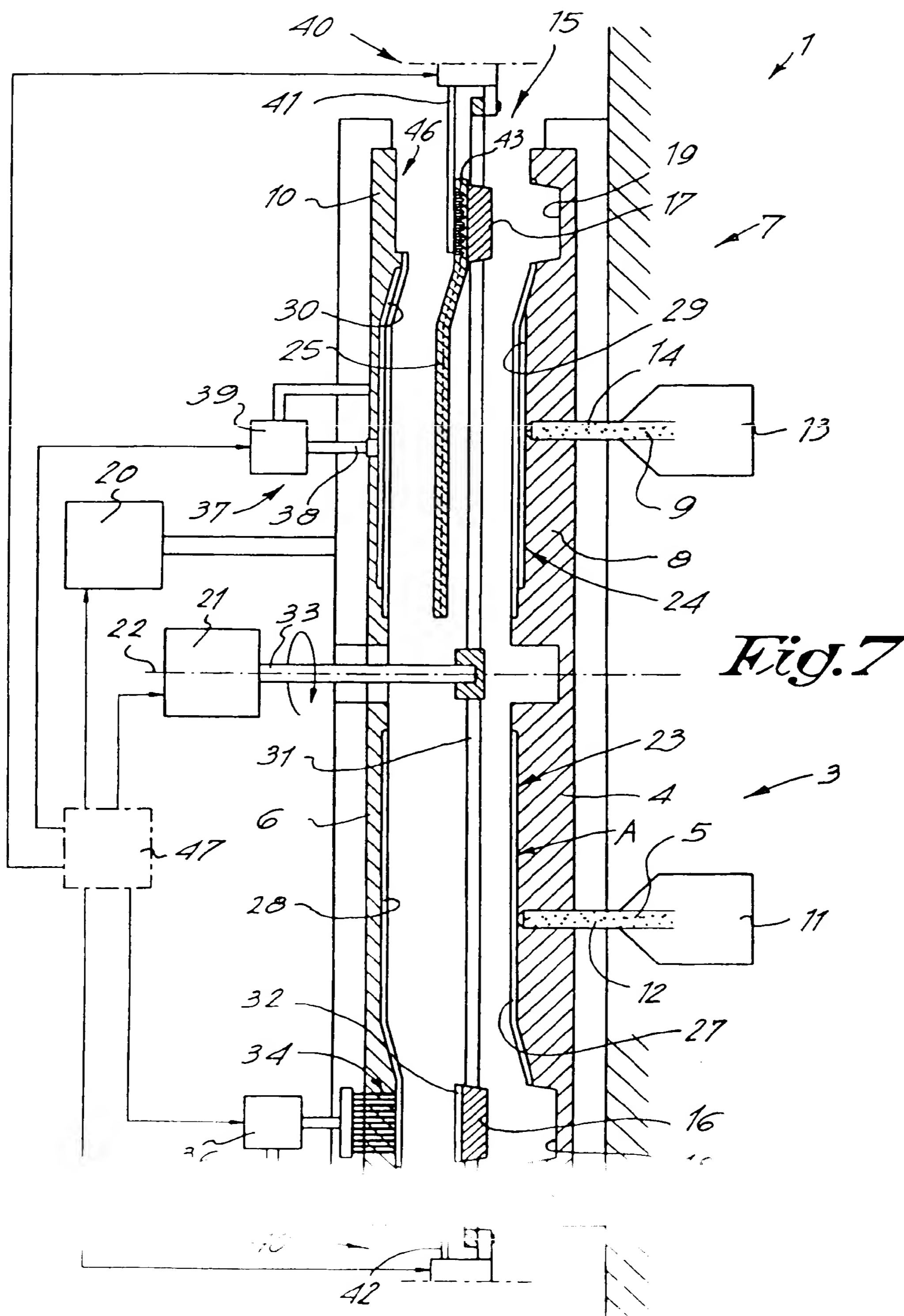
Fig. 2

Fig. 3

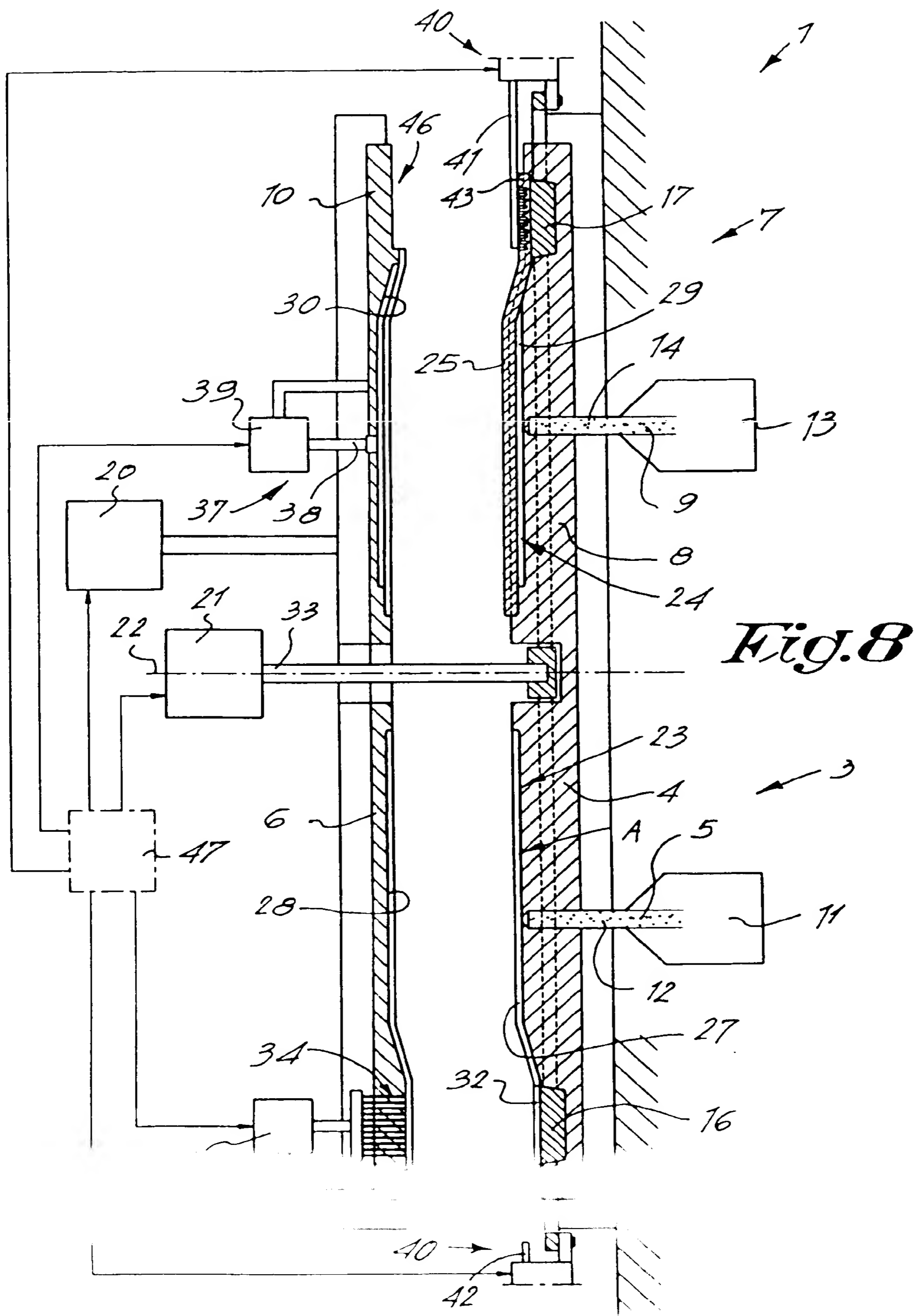




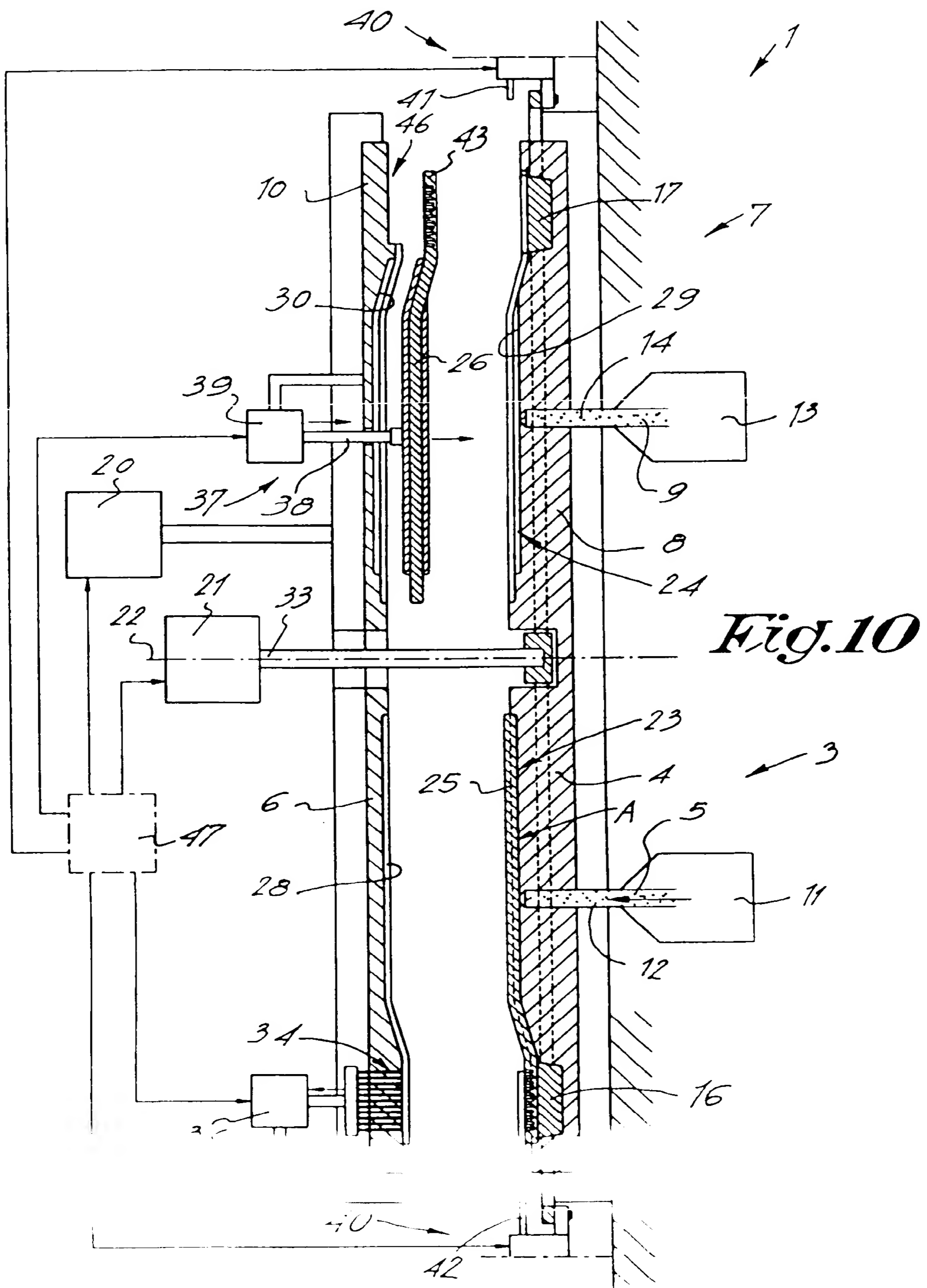


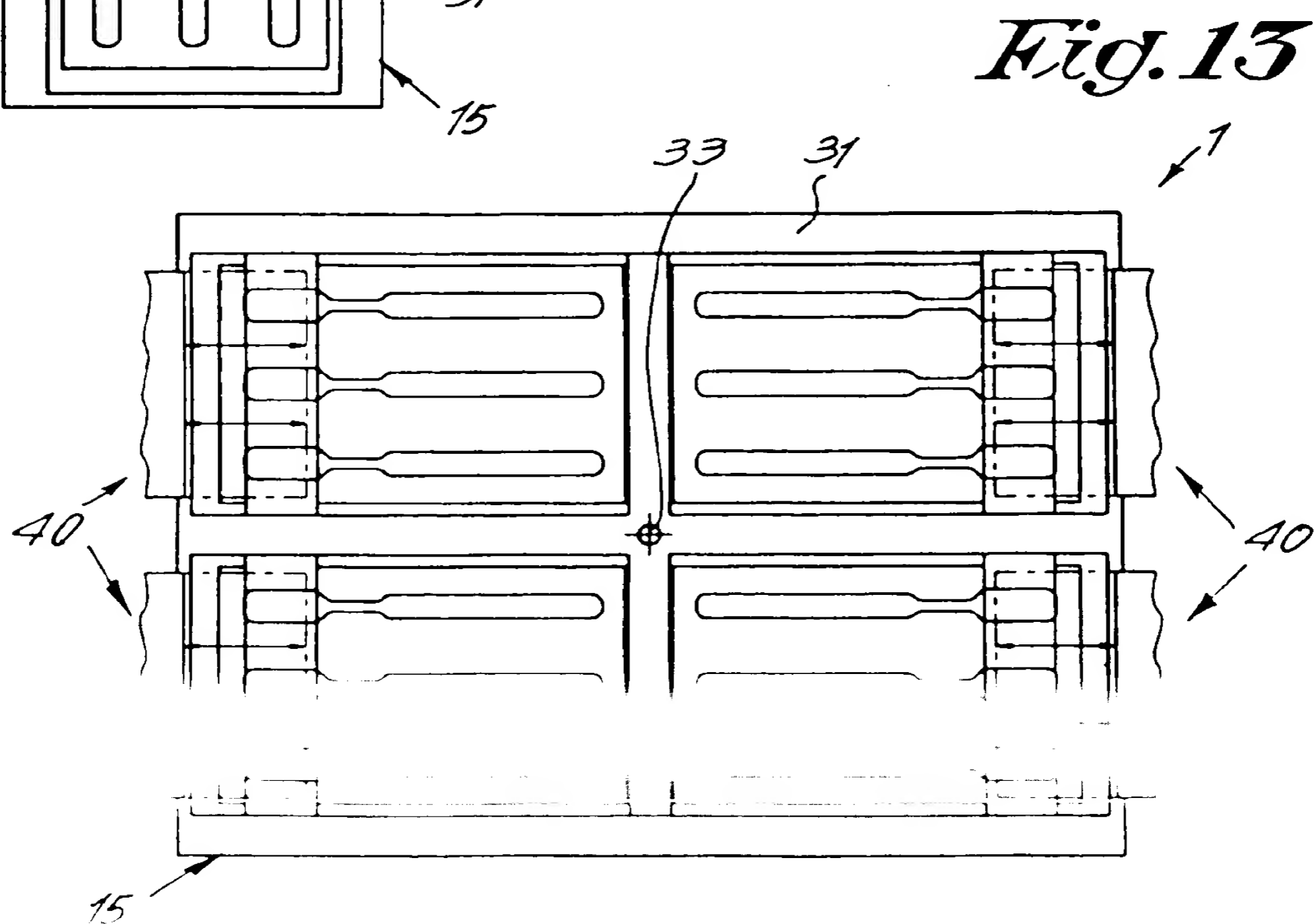
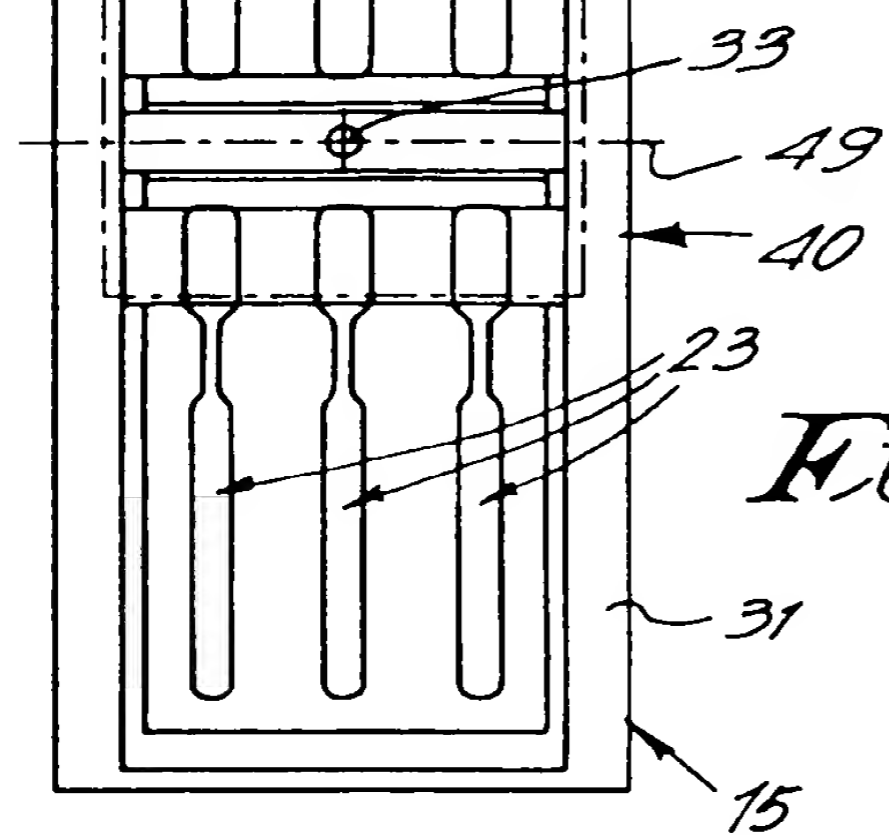
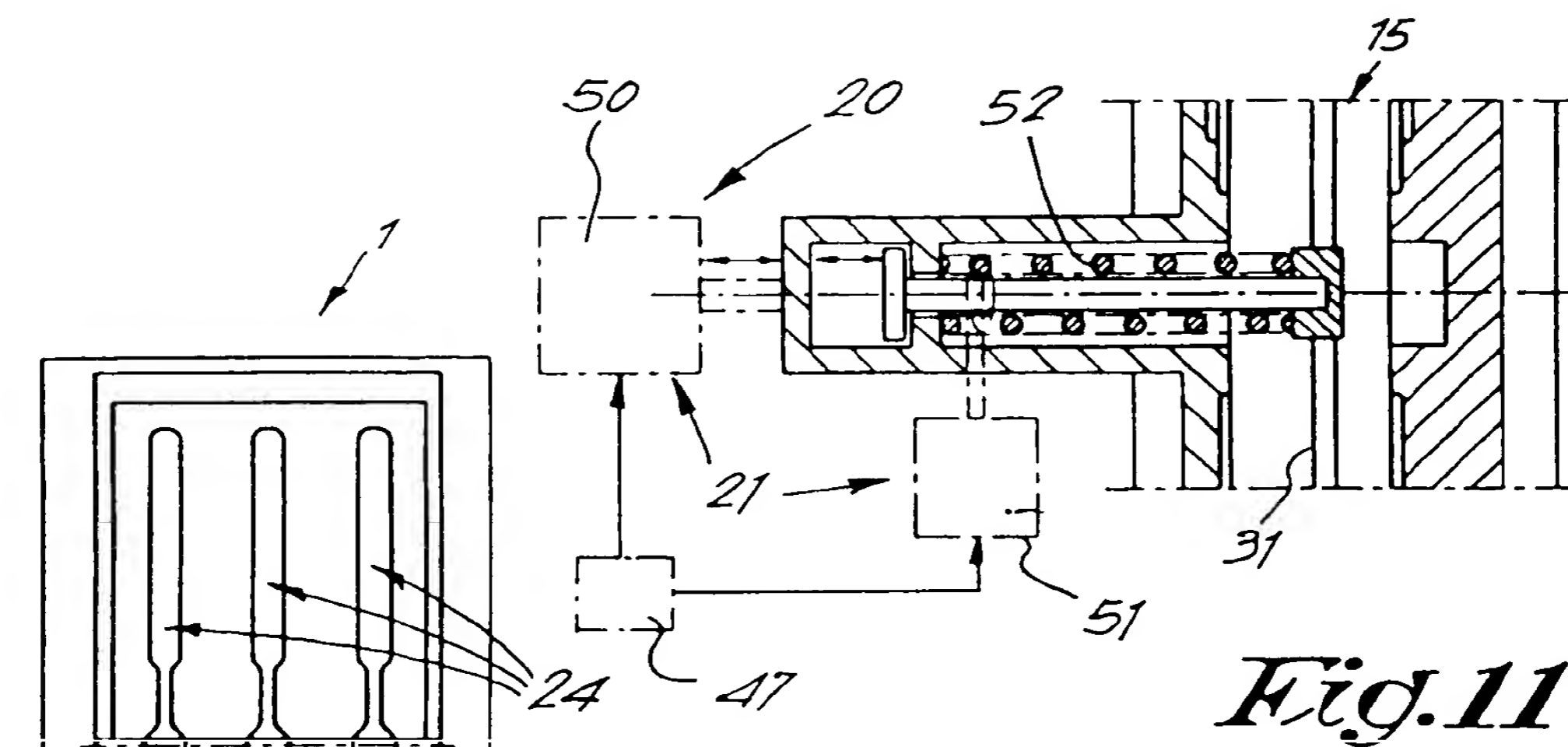


*Fig. 7*













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# EUROPEAN SEARCH REPORT

Application Number  
EP 97 20 2741

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	DE 41 27 621 A (ZAHORANSKY ANTON FA) 25 February 1993 * column 6, line 48 - line 57; claim 6; figures *	1-6,8,9	B29C45/16
A	DE 44 00 649 A (ANTON ZAHORANSKY GMBH & CO) 20 July 1995 * the whole document *	1-6,8,9	
A	DE 44 17 986 A (ZAHORANSKY ANTON GMBH & CO) 23 November 1995 * the whole document *	1-3,8,9	
D,A	EP 0 504 571 A (BOUCHERIE NV G B) 23 September 1992 * the whole document *	1,8,11,13	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B29C A46D
Place of search		Date of completion of the search	Examiner
<p>Particularly relevant if taken alone</p> <p>Particularly relevant if combined with another document of the same category</p> <p>A technological background</p> <p>non-written disclosure</p> <p>intermediate document</p>		<p>document cited in the application</p> <p>document cited for other reasons</p> <p>member of the same patent family, corresponding document</p>	

